IN THE CLAIMS

The following listing of claims will replace all prior listing of claim in the present application:

Listing of Claims:

1 - 10. (canceled)

11. (new) An encoded bitstream having data for predicting an intermediate block in a received B-VOP, the encoded bitstream comprising:

a motion vector associated with a future block of a temporally next reference VOP, the future block spatially coincident with an intermediate block in a received B-VOP;

a temporally next reference VOP used by a decoder to:

determine a first predicting block using a forward scaling of the received motion vector;

determine a second predicting block in the temporally next reference VOP using a backward scaling of the received motion vector; and

predict the content of the intermediate block based on the first predicting block and the second predicting block.

12. (new) The encoded bitstream of claim 11, wherein the forward scaling is performed according to the equation:

$$MVF=(TRB \times MV)/TRD + MVD,$$

wherein TRB is the difference in temporal reference of the B-VOP and the previous reference VOP, TRD is the difference in temporal reference of the temporally next reference VOP with temporally previous reference VOP, MV is the received motion vector; MVD is a received correction motion vector and MVF is the scaled forward motion vector.

13. (new) The encoded bitstream of claim 11, wherein the backward scaling is performed according to the equations:

$$MVB = ((TRB - TRD) \times MV)/TRD, \text{ if MVD is equal to zero, or}$$

$$MVB = (MVF - MV), \text{ if MVD is not equal to zero,}$$

wherein TRB is the difference in temporal reference of the B-VOP and the previous reference VOP, TRD is the difference in temporal reference of the temporally next reference VOP with temporally previous reference VOP, MV is the received motion vector; MVD is a received correction motion vector and MVB is the scaled backward motion vector.

14. (new) The encoded bitstream of claim 11, wherein the decoder predicts the content of the intermediate block by averaging the first predicting block and the second predicting block.

15. (new) The encoded bitstream of claim 11, wherein the encoded bitstream further comprising:

an indication of a prediction mode used to encode the intermediate block.

16. (new) The encoded bitstream of claim 15, wherein the prediction mode is a direct prediction mode.

17. (new) A computing device having a memory storing executable instructions that when executed by a processor, cause the processor to:

receive a motion vector associated with a future block of a temporally next reference VOP, the future block spatially coincident with an intermediate block in a B-VOP;

determine a first predicting block in a temporally previous reference VOP using a forward scaling of the received motion vector;

determine a second predicting block in the temporally next reference VOP using a backward scaling of the received motion vector; and

predict the content of the intermediate block based on the first predicting block and the second predicting block.

18. (new) The computing device of claim 17, wherein the executable instructions, when executed by the processor, further cause the processor to perform the forward scaling according to the equation:

MVF = (TRB x MV)/TRD + MVD,

wherein TRB is the difference in temporal reference of the B-VOP and the previous reference VOP, TRD is the difference in temporal reference of the temporally next reference VOP with temporally previous reference VOP, MV is the received motion vector, MVD is a received correction motion vector and MVF is the scaled forward motion vector.

19. (new) The computing device of claim 17, wherein the executable instructions, when executed by the processor, further cause the processor to perform the backward scaling according to the equation:

$$MVB = ((TRB - TRD) \times MV)/TRD, \text{ if MVD is equal to zero, or}$$

$$MVB = (MVF - MV), \text{ if MVD is not equal to zero,}$$

wherein TRB is the difference in temporal reference of the B-VOP and the previous reference VOP, TRD is the difference in temporal reference of the temporally next reference VOP with temporally previous reference VOP, MV is the received motion vector, MVD is a received correction motion vector and MVB is the scaled backward motion vector.

20. (new) The computing device of claim 17, wherein the executable instructions, when executed by the processor, further cause the processor to predict the content of the intermediate block by averaging the first predicting block and the second predicting block.

21. (new) A computing device having a B-VOP intermediate block predictor apparatus, the predictor apparatus comprising:

a decoder to receive an encoded bit stream and to decode a motion vector associated with a future block of a temporally next reference VOP, the future block spatially coincident with the intermediate block;

means for determining a first predicting block in a temporally previous reference VOP using a forward scaling of the received motion vector;

means for determining a second predicting block in the temporally next reference VOP using a backward scaling of the received motion vector; and

means for predicting the content of the intermediate block based on the first predicting block and the second predicting block.

22. (new) The computing device of claim 21, wherein the first circuit performs the forward scaling according to the equation:

MVF = (TRB x MV)/TRD + MVD,

wherein TRB is the difference in temporal reference of the B-VOP and the previous reference VOP, TRD is the difference in temporal reference of the temporally next reference VOP with temporally previous reference VOP, MV is the received motion vector, MVD is a received correction motion vector and MVF is the scaled forward motion vector.

23. (new) The computing device of claim 21, wherein the second circuit performs the backward scaling according to the equations:

MVB = ((TRB – TRD) x MV)/TRD, if MVD is equal to zero, or

MVB = (MVF – MV), if MVD is not equal to zero,

wherein TRB is the difference in temporal reference of the B-VOP and the previous reference VOP, TRD is the difference in temporal reference of the temporally next reference VOP with temporally previous reference VOP, MV is the received motion vector, MVD is a received correction motion vector and MVB is the scaled backward motion vector.

24. (new) A computing device having a video decoder, the video decoder comprising:

a forward mode predictor coupled to a source of coded VOP data;

a backward mode predictor coupled to the source of coded VOP data;

an interpolation mode predictor coupled to the source of coded VOP data; and

a direct mode predictor coupled to the source of coded VOP data, the direct mode predictor comprising:

a first prediction circuit to predict data for a block in the first VOP from data in a first previously decoded VOP in a first temporal direction, the data in the first previously decoded VOP being identified by a first scaling of a motion vector associated with the first VOP;

a second prediction circuit to predict data for the block in the first VOP from data in a second previously decoded VOP in a second temporal direction, the data in the second previously decoded VOP being identified by a second scaling of the motion vector; and

a prediction output circuit to generate predicted data for the block in the first VOP based upon outputs from the first and second prediction circuits.

25. (new) The computing device of claim 24, wherein the first and second scalings are given respectively by:

MVF = (TRB x MV)/TRD + MVD, and

MVB = (MVF - MV), where

MV represents the motion vector, TRB represents a temporal difference between the first VOP and the first previously decoded VOP, TRD represents a temporal difference between the first and second previously decoded VOPs, MVD represents a correction motion vector associated with the first VOP, MVF represents a first scaling of the motion vector and MVB represents a second scaling of the motion vector.

26. (new) The computing device of claim 24, wherein the direct predictor comprises a previous picture store and a future picture store, to store the first and second previously decoded VOPs.

27. (new) A computing device having a video decoder, the video decoder comprising:

a variable length decoder;

a processing circuit, coupled to the variable length decoder, to inverse quantize and transform data output from the variable length decoder;

an adder having a pair of inputs, one input coupled to an output of the processing circuit; and

a predictor, comprising:

a motion vector processor having an input for received motion vectors and an output for scaled motion vectors;

first and second picture memories to store previously decoded video data, each responsive to input vector data by outputting addressed video data therein;

a first switching system, coupled to the motion vector processor and the first and second picture memories, to selectively direct either the received motion vectors or the scaled motion vectors to the first and second picture memories as determined by a coding identification signal;

an averager coupled to outputs of the first and second picture memories; and

a second switching system selectively coupling the second input of the adder to one of the first picture memory, the second picture memory and the averager as determined by the coding identification signal.

28. (new) The computing device of claim 27, wherein an output of the adder is coupled to the first picture memory and an output of the first picture memory is input to the second picture memory.

29. (new) The computing device of claim 27, wherein the motion vector processor generates a scaled motion vector from a received motion vector according to:

MVF = (TRB x MV)/TRD + MVD, and

MVB = (MVF - MV), where

MV represents the received motion vector, TRB represents a temporal difference between a currently decoded picture and a picture stored in the first picture memory, TRD represents a temporal difference between pictures stored in the first and second picture memories, MVD represents a correction motion vector associated with the first currently decoded picture, MVF represents a first scaling of the received motion vector and MVB represents a second scaling of the received motion vector.

30. (new) The computing device of claim 27, wherein, when the coding identification signal indicates forward prediction, the first switching system couples the first picture memory to the received motion vectors and the second switching system couples the input of the adder to the first picture memory.

31. (new) The computing device of claim 27, wherein, when the coding identification signal indicates backward prediction, the first switching system couples the second picture memory to the received motion vectors and the second switching system couples the input of the adder to the second picture memory.

32. (new) The computing device of claim 27, wherein when the coding identification signal indicates interpolation prediction, the first switching system

couples the first and second picture memories to the received motion vectors and the second switching system couples the input of the adder to the averager.

33. (new) The computing device of claim 27, wherein, when the coding identification signal indicates direct prediction, the first switching system couples the first and second picture memories to the motion vector processor and the second switching system couples the input of the adder to the averager.

34. (new) A computing device having a video decoder, the video decoder comprising:

a variable length decoder;

a processing circuit, coupled to the variable length decoder, to inverse quantize and transform data output from the variable length decoder;

an adder having a pair of inputs, one input coupled to an output of the processing circuit; and

a predictor, comprising:

a motion vector processor, having an input for received motion vectors and an output for scaled motion vectors;

first and second memories to store data of previously decoded video object planes (VOPs), each responsive to input vector data by outputting addressed video data therein;

a first switching system, coupled to the motion vector processor and the first and second memories, to selectively direct either the received motion vectors or the scaled motion vectors to the first and second memories as determined by a coding identification signal;

an averager coupled to outputs of the first and second memories; and

a second switching system selectively coupling the second input of the adder to one of the first memory, the second memory and the averager as determined by the coding identification signal.

35. (new) The computing device of claim 34, wherein an output of the adder is coupled to the first memory and an output of the first memory is input to the second memory.

36. (new) The computing device of claim 34, wherein the motion vector processor generates a scaled motion vector from a received motion vector according to:

MVF = (TRB x MV/TRD + MVD, and

MVB = (MVF - MV), where

MV represents the received motion vectors, TRB represents a temporal difference between a currently decoded VOP and a VOP stored in the first memory, TRD represents a temporal difference between VOPs stored in the first and second memories, MVD represents a correction motion vector associated with the first currently decoded VOP, MVF represents a first scaling of the received motion vector and MVB represents a second scaling of the received motion vector.

37. (new) The computing device of claim 34, wherein, when the coding identification signal indicates forward prediction, the first switching system couples the first memory to the received motion vectors and the second switching system couples the input of the adder to the first memory.

38. (new) The computing device of claim 34, wherein, when the coding identification signal indicates backward prediction, the first switching system couples the second memory to the received motion vectors and the second switching system couples the input of the adder to the second memory.

39. (new) The computing device of claim 34, wherein, when the coding identification signal indicates interpolation prediction, the first switching system couples the first and second memories to the received motion vectors and the second switching system couples the input of the adder to the averager.

40. (new) The computing device of claim 34, wherein, when the coding identification signal indicates direct prediction, the first switching system couples the first and second memories to the motion vector processor and the second switching system couples the input of the adder to the averager.